Misrepresentation of health and nutrition claims in food marketing to children could adversely affect food choice and increase risk of obesity

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Abstract

Objective: To investigate the nutritional quality of foods marketed to children in the United Kingdom, to explore the use of health and nutrition claims and to assess their healthiness.

Design: This cross-sectional study was carried out in seven UK supermarkets, Tesco, Aldi, Sainsbury's, Morrisons, Asda, Lidl and Waitrose. Products marketed as healthy to children above the age of 1 year containing child oriented imagery including cartoon characters and terms such as 'one of 5-a-day' on product packaging were identified both in stores and online. Information on the sugar, salt and fat content, as well as health and nutrition claims was recorded. The Ofcom Nutrient Profiling Model (NPM) was used to assess if products were healthy.

Results: Three hundred and thirty-two products, including breakfast cereals, fruit snacks, fruit-based drinks, dairy products and ready meals were sampled. The use of cartoon characters (91.6%), nutrition (41.6%) and health (19.6%) claims were common marketing techniques. The one of 5-a-day claim was also common (41.6%), but 75.4% (103) products which made this claim were made up of less than 80g of fruit and vegetables. Sugar content (mean ± SD per 100g) was high in fruit snacks (48.4g ±16.2g), cereal bars (28.9g ±7.5g) and cereals (22.9g ±8.0g). Overall, 41.0% of the products were classified as less healthy according to the Ofcom NPM.

Conclusion: A large proportion of products marketed to children through product packaging are less healthy and claims used on product packaging are misrepresentative. Strict regulations on food labelling and product composition are required.

Introduction

The burden of childhood obesity is associated with increased availability, widespread targeted marketing and increased consumption of unhealthy obesogenic foods that are high in sugar, saturated fats, and salt (1, 2) . Child-focused marketing techniques which create an emotional appeal of fun by using cartoon characters, toys, games and promotions have been long used for advertising (3-5) while the use of health and nutrition claims is a more recent trend (6, 7). These marketing techniques have been shown to create a cognitive bias which occurs when a claim about a single health quality of a product creates a positive impression of the food also known as the "health halo effect" (8, 9).

In the UK, regulations such as control of food television advertising targeting children (10) taxation (11, 12) and removal of food products from public institutions (13) have been implemented to mitigate the marketing of "less healthy foods" such as confectionary and sugar sweetened beverages to children. Marketing of regular foods considered "healthy" through packaging in stores and online has not received much attention. This is important given the UK government's commitment to reduce childhood obesity (2, 14).

We aimed to investigate the nutritional quality of foods marketed to children in terms of their energy, fat, sugar and salt content. We also explored the use of health and nutrition claims such as 5-a-day claims on the packaging of these products and determined whether they were "healthy" or "less healthy" using a nutrient profiling model.

Methods

This cross-sectional survey sampled nutritional information on food packages at point-of-sale (in store) and online from foods marketed to children. Seven UK supermarkets: Tesco, Aldi, Sainsbury's, Morrisons, Asda, Lidl and Waitrose; were selected because they have a large market share, 89.6%, in the U.K (15). Data was surveyed between May and July 2016 and November and December 2017. Further corroboration of data entry was done in June 2018. Overall, three different researchers checked the database for accuracy.

The selection and inclusion criteria was adapted from previous studies on child food advertising (16, 17). Foods were identified and included if they contained any of the following in their food packaging: cartoon imagery (licenced or unlicensed), child friendly images, puzzles, games, toys and activities or promotions appealing to children (i.e. collecting cards, amusement park vouchers), as well as terms such as 'children', 'child', 'kids', or 'little/young ones' and references to 'lunch box' or 'growing up' Products were then further selected if they were promoted as 'healthy' or "good" for children Foods such as cereals, yoghurts, ready meals and fruit juices that are regularly consumed as part of a healthy diet, were included. An online search was also carried out on the same supermarket websites using child related terms but in combination with words such as yoghurts, meals, cereals and fruit juices, this was done to ensure all products were considered,

Exclusion criteria were: 1) foods marketed to children under 12 months of age because of differences in nutrition composition requirements and regulations 2) cakes, biscuits confectionary items, crisps and soft drinks because they are high in fat, sugar and salt and are considered less 'healthy', 3) fresh and unpacked foods (i.e. fruit and vegetables).

Data Extraction

All information was obtained from food packaging and labels. Food products were classified according to product traits or similar ingredients as follows: ready to eat breakfast cereals, cereal bars, fruit juices, juice drinks, smoothies, dairy and dairy alternatives (yoghurt, fromage frais and cheese snacks), ready meals and fruit snacks. Nutrition information on energy (kcal and joules), saturated fat (g), fat (g), carbohydrates (g), total sugars (g), protein (g), fibre (g), and salt (g) were recorded per 100g. Nutrients labelled as <0.1g or <0.05g were rounded down to 0.09g and 0.49g respectively for analysis. Fruit and vegetable content was also recorded. Products which had ambiguous information on concentrated fruit juice content were assumed to be made of 100% fruit because estimation of the proportion of concentrated fruit juice in the products was difficult.

The use of cartoon imagery, inclusion of toys or other child promotions and the presence of nutrition, health and unregulated statements on product packaging and on websites was also assessed. Single words, phrases, sentences, symbols, logos or images were considered. The European Food Safety Authority definitions of nutrition claims and health claims were used (18). Unregulated statements were defined as phrases which had no scientific sense i.e. “no funny business”, “no added non-sense”, “superhero start to the day”.

The use of the “5-a-day” claim was recorded and fruit and vegetable content of products which made this claim was calculated. The recommended adult portion size, 80g, was used to assess the validity of 5-a-day claims (19). Due to lack of unified recommendations for fruit and vegetables in children, 40g, the amount most children in the UK eat, was also used to assess validity of 5-a-day claims (20).

Foods were classified as sweet or savoury based on product name and description (21). The Public Health England 5% reduction goal was used to set high sugar content thresholds, >14.6g/100g for cereals and >12.3g/100g for yogurt, after the 10g dried fruit and 3.8g lactose

allowance were considered (14). Other food categories in the sugar reduction report, were excluded in the current study (14).

Analysis

Nutrient profiling Model (NPM)

The nutritional quality of the food products was assessed using the 2011 Ofcom NPM (10). This model classifies foods using a scoring system calculated from nutrient and food component information in food labels. The score consists of 7 components, 4 negative (energy, total sugars, saturated fat and sodium) and 3 beneficial (fruit, vegetables and nuts; fibre and protein). Foods and non-alcoholic drinks are classified as less healthy if they score 4 or more points and one or more points respectively. The model was recently updated and stringent regulations which recommend the use of free sugars instead of total sugars were suggested (22). Although ideal, estimating free sugars using the new model was a challenge because they are not currently declared on the nutrition panel of foods (23). Data analysis was conducted using IBM SPSS for Windows statistical software package version 22.0. Descriptive statistics were used for analysis and Chi square tests were used to test associations between health and nutrition claims and the Ofcom NPM.

Results

Three hundred and thirty-two products from 41 different brands were identified. A description of the nutrient composition of the products is provided in Table 1. Cereal bars on average had the highest energy and saturated fat content. Cereals on the other hand had the highest protein, salt and carbohydrate content, while fruit snacks had the highest sugar and fibre content (Table 1).

Types of claims made, marketing strategies, use of processed fruit as ingredient and nutrient profiling classification of the product categories are presented in Table 2. Cartoons on

product packaging were the most common marketing technique used followed by promotions and free toys (Table 2). Most products, were classified as sweet and only two products were classified as neutral meaning they didn't suggest to have a savoury or sweet taste (Table 2). One third of products contained concentrated fruit juice as an added ingredient and one quarter used pureed fruit. Nearly a quarter of the products made "no added sugars" claims most of which were fruit-based beverages and fruit snacks (Table 2). Among these, 50.0% (80) % had concentrated juice and fruit puree as added ingredients (Figure 1) . Cereals and dairy products were more likely to make micronutrient claims. Overall just a small proportion of products made high fibre, wholegrain or unregulated claims, -(Table 2). Almost half the products, made 5-a-day claims, most of which were fruit-based drinks, ready meals and fruit snacks (Table 2). Most of these products claimed to have one portion size of fruit and vegetables, 81.9% (113) and a few, 14.5 % (20) claimed to have more than one portion size of fruit and vegetables, but all of these were made up of less than 80g of fruits and vegetables. Half of the products which made the 5-a-day claim 52.2% (72) did not specify whether they were referring to a child or adult portion of fruit and vegetables. There are currently no child portion size recommendations for fruit and vegetables intake, but 18.8% (26), referred to a childs sized portion and we assumed this to be 40g. However, the reference portion size in these products was not clearly stated and ranged from 19g to 50g. The rest, 29.0% (40) claimed to have adult portion sizes (80g).

Processed fruit, concentrated fruit juice or fruit puree, were ingredients in 44.2% which made the 5 a day claim. Words such as "crushed", "pressed", "mashed" were used to describe

Figure 1: Proportion of products which made no added sugar claim (n=80) but contain concentrated fruit juice and fruit puree as an ingredient

Table 1: Nutrient content (mean ± SD) of different foods marketed to children (n=332)

	Cereals (n=73)	**Cereal bars (n=9)**	**Fruit juices (n=11)**	**Juice drinks (n=9)**	**Smoothies (n=22)**	**Fruit snacks (n=72)**	**Dairy and dairy alternatives (n=75)**	**Ready meals (n=61)**
% (n)	22.0 (73)	2.7(9)	3.3 (11)	2.7(9)	6.6(22)	21.7(72)	22.6(75)	18.4(61)
Energy (Kcal)	393.0±24.7	417.9±21.3	45.9±4.58	34.7±5.11	56.8±9.50	314.4±90.7	125.8±84.1	101.2±37.5
Energy (KJ)	1660±98.4	1760.4±87.8	193.5±19.3	147.3±22.6	240.6±40.5	1326.1±380.5	527.6±347.9	425.7±157.6
Total sugar (g)	22.9±8.02	28.9±7.48	10.2±1.65	7.67±1.64	12.1±2.06	48.4±16.2	9.79±3.77	2.56±0.91
Fats (g)	4.25±4.85	11.9±3.02	0.15±0.22	0.04±0.05	0.15±0.18	4.10±6.81	5.71±7.91	3.17±1.59
Saturated fats(g)	1.06±1.14	8.39±4.21	0.02±0.04	0.03±0.05	0.01±0.03	2.52±4.97	3.56±5.03	1.24±0.85
Salt (mg)	530.0±320.0	470.0±270.0	4.00±10.0	10.0±20.0	2.00± 1.00	160.0±140.0	340.0±550.0	260.0±150.0
Fibre (g)	4.62±2.41	2.77±1.46	0.45±0.25	0.10±0.18	0.69±0.48	5.43±3.18	0.39±1.04	1.47±0.72
Carbohydrates (g)	78.9±7.17	71.2±2.85	11.4±3.33	7.86±1.14	13.1±2.02	64.1±15.4	11.7±5.00	12.7±5.19
Protein(g)	7.36±1.72	5.35±0.83	0.43±0.24	0.16±0.15	0.39±0.26	2.25±1.41	6.94±6.01	4.87±2.20

Table 2: Description of food products sampled according to marketing strategies, use of processed food as an ingredient, claims, and nutrient profiling classification %(n)

	(n=332)	**Cereals (n=73)**	**Cereal bars (n=9)**	**Fruit juice (n=11)**	**Juice drinks (n=9)**	**Smoothies (n=22)**	**Fruit snacks (n=72)**	**Dairy alternatives (n=75)**	**Ready meals (n=61)**
Marketing									
Cartoons	91.6 (304)	100.0 (73)	100.0 (9)	100.0 (11)	100.0 (9)	100.0 (22)	87.5 (63)	84.0 (63)	100.0 (61)
Toys	3.6 (12)	-	-	-	-	-	12.5 (9)	4.0 (3)	-
Promotion	2.1 (7)	1.4 (1)	-	-	-	-	-	8.0 (69)	-
Taste									
Sweet	77.7 (258)	97.3(71)	100.0 (9)	100(11)	100.0(9)	100.0(22)	100.0(72)	85.3(64)	-
Savoury	21.7 (72)	-	-	-	-	-	-	14.7(11)	100.0(61)
Ingredients									
Concentrated fruit juice	29.5 (98)	-	-	27.3 (3)	100.0 (9)	50.0 (11)	44.4 (32)	37.3 (28)	24.6 (15)
Purees	23.8 (79)	-	-	9.1(1)	11.1(1)	59.1 (13)	36.1(26)	45.3(34)	6.60(4)
Claims									
Health	19.6 (65)	13.7 (10)	-	18.2 (2)	-	-	-	58.7 (44)	14.8 (9)
Micronutrient	41.3 (137)	64.4 (47)/	55.6 (5)	36.4 (4)	22.2 (2)	-	5.6 (4)	86.7 (65)	16.4 (10)
5-a-day	41.6(138)	1.4(1)	-	63.6 (7)	88.9 (8)	100.0 (22)	63.9 (46)	-	93.4 (57)
Fibre	14.8 (49)	26.0 (19)	22.2 (2)	-	-	-	37.5 (27)	-	1.6 (1)
No added sugars	24.1 (80)	1.4 (1)	-	18.2 (2)	33.3 (3)	81.8 (18)	50.0 (36)	12.0 (9)	18.0 (11)
Wholegrain	3.9 (13)	17.8 (13)	-	-	-	-	-	-	-
Unregulated	8.5 (28)	1.4 (1)	-	9.1 (1)	-	31.8 (7)	13.9 (10)	12.0 (9)	-
Ofcom (n=329)									
Less healthy	41.0 (135)	55.6 (40)	88.9 (8)	-	-		51.4(37)	33.3(25)	-
Healthy	59.0 (194)	44.4 (32)	11.1 (1)	100.0 (9)	100.0 (9)	100.0(22)	48.6(35)	66.7(50)	100.0 (61)

processed fruit without specifying whether fruit juice or fruit puree was used 3.6% . The serving size for most fruit-based beverages, 94.6%, was above the recommend 150ml of fruit juice. In contrast, the fruit and vegetable portions for most products were below the recommended portion size; only a quarter were made up of 80g and a third were made up of 40g of fruit and vegetables (Table 3)

Close to half the products were classified as less healthy. Cereal bars were more likely to be classified as less healthy followed by cereals and fruit snacks (Table 2). Products with 5-a-day and micronutrient claims were more likely to be classified as healthy compared to those without claims. Based on child portions of fruit and vegetables, products which contained less than 40g of fruit and vegetables were more likely to be classified healthy, this is due to low salt, saturated fats and sugar content (Table 3). However, there was no difference in health classification in products which made 5-a-day claims when adult portion sizes (80g) were used. There was also no difference in health classification in products which made health, fibre and no added sugar claims.

A large proportion of cereals, had a high sugar content and were more likely to be classified as less healthy compared to those with low sugar content (Table 3). Although all yoghurt products were classified as low sugar, 62% were classified as less healthy according to the NPM.

Table 3: Association between claims made on foods marketed to children and Ofcom nutrient profiling model % (n)

Claims	% (n)	Ofcom Healthy	Less healthy
5-a-day claim			
Claim	41.6 (138)	85.5 (118)	14.5 (20)
No claim	58.4 (194)	38.9 (76)	60.2 (115)
P value		<0.001	
Contains at least (n=138)			
1 child sized portion of fruit and vegetables (40g or 150ml)			
True	37.7 (53)	75.0 (40)	25.0 (13)
False	62.3 (86)	91.9 (79)	8.1 (7)
P value		0.006	
1 adult sized portion of fruit and vegetables (80g or 150ml)			
True	24.6 (35)	77.1 (27)	22.9 (8)
False	75.4 (103)	88.3 (91)	11.7 (12)
P value		0.085	
Micronutrient			
Claim	41.3 (137)	48.9 (67)	51.1 (70)
No claim	58.7 (195)	66.1 (127)	33.9 (65)
P value		0.002	
Fibre			
Claim	14.8 (49)	61.2(30)	38.8(19)
No claim	85.2 (283)	58.6(164)	41.4(116)
P value		0.728	
Health			
Claim	19.6 (65)	50.8 (33)	49.2 (32)
No claim	80.4 (267)	61.0 (161)	39.0 (103)
P value		<0.134	
No added sugar			
Claim	24.1(80)	61.3(49)	38.8(31)
No claim	75.9(252)	58.2 (145)	41.8(104)
P value		0.633	
Concentrated fruit juice (n=332)			
Added	29.2 (98)	56.1 (55)	43.9 (43)
Not added	70.8 (231)	60.2 (139)	39.8 (93)
P value		0.495	
Cereals (n=82)			
Low sugar	12.2 (10)	90.0 (9)	10.0 (1)
High sugar	87.8 (72)	33.8 (24)	66.2 (47)
P value		0.001	
Yoghurt (n=64)			
Low sugar	100.0(64)	38.1 (24)	61.9 (39)

*80g recommended adult portion size $40g portion size for children no formal recommendations;
Cereals: **High sugar:** any product which contains more than 14.6g of sugar per 100g.**Yoghurt: High sugar:** Any product which contains more than 12.3 g of sugar per 100g

Discussion

This study investigated the nutritional quality and the use of health and nutrition claims in foods marketed to children in the UK. Our survey showed that the use of cartoon characters on product packaging was a popular marketing technique which is consistent with findings from other studies (3, 9, 24, 25). The association of food with fun is likely to create the impression that food is a form of entertainment and is likely to increase the intake of less healthy foods (3, 26). There is therefore a need to regulate the use of fun themes and cartoon characters in the marketing of children's foods , in line with a more holistic approach to reduce obesogenic environments as in the case of Chile (27).

A large proportion of the products were classified as "less healthy" according to the Ofcom NPM. Furthermore, inaccurate health and nutrition claims were common, which is consistent with findings from other studies (6, 7, 16, 24, 28, 29). In a similar survey in the UK, Fitzhugh and Lobstein (29) found that 77% (n=356) of products marketed to children were considered less healthy because of high sugar, salt or fat content (29).. Similarly, in Australia, a study assessing the quality of 156 child-oriented packaged foods showed that over half the products, 67.3%, were classified as less healthy according to two nutrient profiling methods (16). The relatively higher proportion of less healthy products in these studies in comparison to ours can be explained by the inclusion of products such as cakes and biscuits, dressing and sauces and spreads. On the other hand, a Canadian study assessing the nutritional quality of 367 pre-packaged "regular" foods, that is more comparable with our survey, described 89% of the foods as poor nutritional quality (28). The lower proportion of unhealthy foods in our survey can be attributed to purposely selecting foods with a healthy halo. Still it is worrying

that our survey found a large proportion of foods which are commonly consumed and perceived as healthy to indeed be “less healthy”.

The use of the 5-a-day claim was common and although products which made this claim were more likely to be classified as healthy, few provided the recommended adult (80g) and estimated child (40g) portions of fruit and vegetables. The lack of a standard child portion for fruit and vegetables makes the 5-a-day claim open to misinterpretation. This shows the need for a standardized portion size of fruit and vegetable intake in children. Although the use of the 5-a-day government logo is regulated, food manufacturers have identified loopholes which enables them to use this claim without including the government logo (30) but this is misleading for consumers. Products which make the 5-a-day claim should be required to state the quantity of all fruits and vegetables in the ingredient list to support their claims. The current labelling regulation does not provide clear information on total amount and type of fruit and vegetable used in the formulation: this is particularly complex for those highly processed snacks made from 100% fruit which often make 5-a-day claims but are mostly classified as less healthy.

Cereals and cereal bars had on average a high sugar content. These findings are consistent with studies which show that foods marketed to children tend to have high sugar content (17, 28, 29, 31) and highlights the widespread use of sugar as a flavour enhancer in the food industry (29). While cereals are the main source of free sugars for most children in the UK, they are also a source of fibre and micronutrients (28, 32-34). This is supported by studies which show that children who eat cereals have better nutrition profiles than those who do not (35, 36).

Diary products are a good source of protein and calcium for children (37), but in this study, a large proportion of yoghurts were classified as less healthy because of their high saturated fat

and low fibre content. Considering the potential benefits of breakfast cereals and yoghurts, there is a need to regulate their sugar, salt and fat content as well as the use of misrepresenting nutrition and health claims.

Fruit snacks had on average the highest sugar content, but most made the 5-a-day claim, which is likely to confuse parents who are bombarded with multiple health and nutrition messages on product packaging. .

Processed fruits were used in fruit juices, smoothies and fruit snacks yet a large proportion of these products made no added sugar claims. Processed fruits are perceived by the public as a healthy natural alternative to added sugars, but because of the breakdown of the cellular structure, they potentially have the same negative effect on weight gain as other forms of sugar, which is why they have recently been classified as free sugars in the UK (38-40). This new classification, together with the proposed modified Ofcom NPM which considers all sugars in fruit juice and smoothies as free sugars, may reduce the proportion of "healthy" high sugar foods marketed to children. However, for these to be effective, declaration of free sugar content rather than total sugars by food manufactures is imperative. This will make estimation of free sugars easier and fair, but there is resistance from food companies when it comes to declaring free sugar content (28). This raises the question of the validity of the total sugar content declared on product packaging. Misrepresenting and unregulated statements and words were also relatively common especially on fruit snacks and fruit-based drinks and strict regulations on their use is required.

This survey showed the misuse of health and nutrition claims in foods marketed as healthy to children and the need for stricter regulations on food labelling and product composition. The use of processed fruit and the sugar content of "healthy" child foods was explored, but there

is still a need to describe the types of caloric and non-caloric sweeteners used in foods marketed to children as well as the impact of non-caloric sweeteners on child health. We attempted to include a representative sample of products, but because of the versatile nature of products in the food industry there is a chance we excluded some products. Estimations were used in calculation of fruit and vegetable content because of inadequate information provided in the ingredient lists.

Prepacked foods targeted to children can be consumed as part of a "healthy" diet, yet their health and nutrition claims remain questionable. Given the current rising rates of childhood obesity the consumption of less healthy foods may have long term negative implications on child health. Strict regulations on product composition, food labelling and marketing techniques are required to discourage the promotion of foods which might be considered obesogenic .

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Competing interests: None.

What is known about this topic

- Obesity during childhood is a public health problem worldwide that is associated with intake of foods high in fat, sugar and salt.
- Use of cartoons and health claims to market less healthy foods are potentially misrepresenting, as they increase the consumption

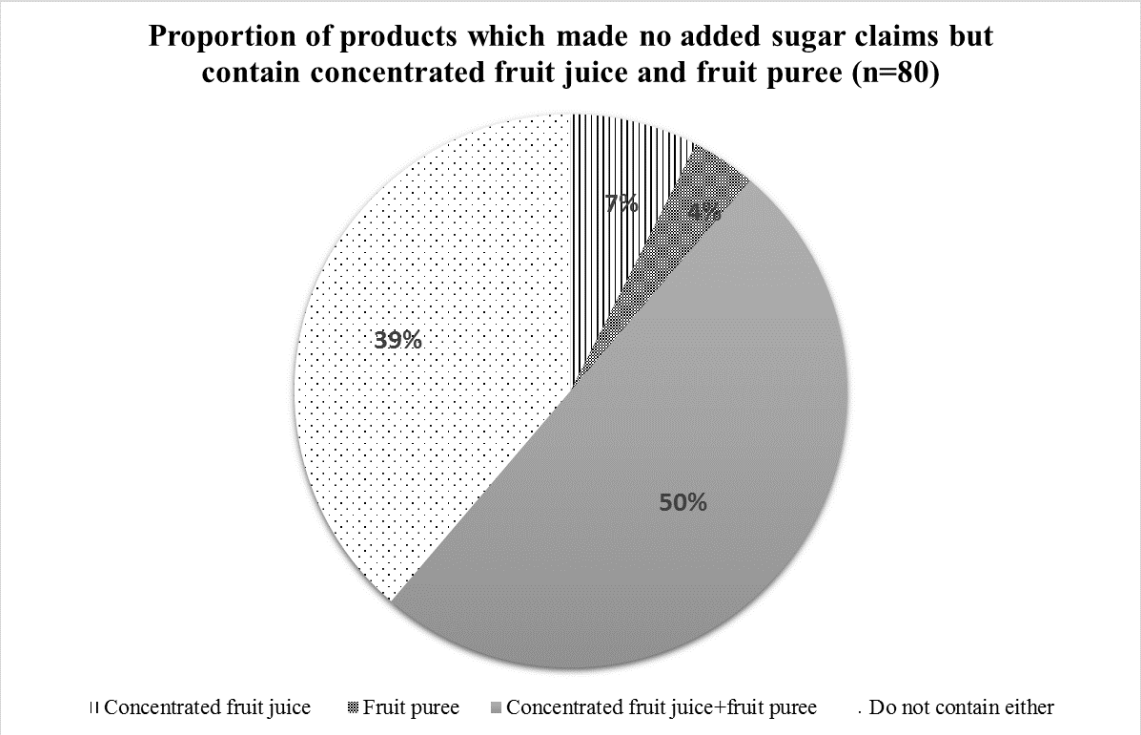
- Strict regulations on product composition and product marketing through packaging are required

This study highlights

- A large proportion of foods that are marketed as healthy for children in the United Kingdom are less healthy
- Health and nutrition claims used on product packaging are misrepresenting. The "5-a-day" claim is used to create a health halo over foods high in sugar
- There is a need for strict regulations on product labelling and marketing to support consumer choices

Figure Legends

Figure 1: Proportion of products which made no added sugar claim (n=80) but contain concentrated fruit juice and fruit puree as an ingredient



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